



09-11-01

Evacuation Slide And Slide/Raft Reliability

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Topics To Be Covered

- Design issues
- Deployment intervals
- Maintenance practices
- FAA regulations
- Accident and incident investigations

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Importance Of Evacuation Systems



- Although accidents are rare statistically, they will continue to occur
- When they do occur, evacuation systems must work flawlessly
 - Consequences of failure can be lethal to passengers and crew





Romulus, Michigan (Dec. 1990)

- Northwest Airlines DC-9 and 727 involved in ground collision
- 727 wing destroyed the two right side exits
- Tailcone exit malfunctioned and did not open
 - Bodies of one flight attendant and one passenger found in tailcone





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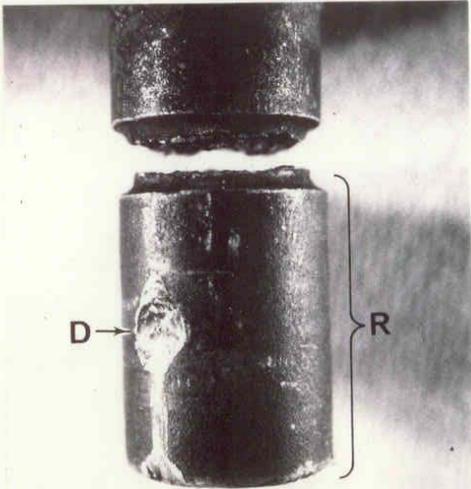
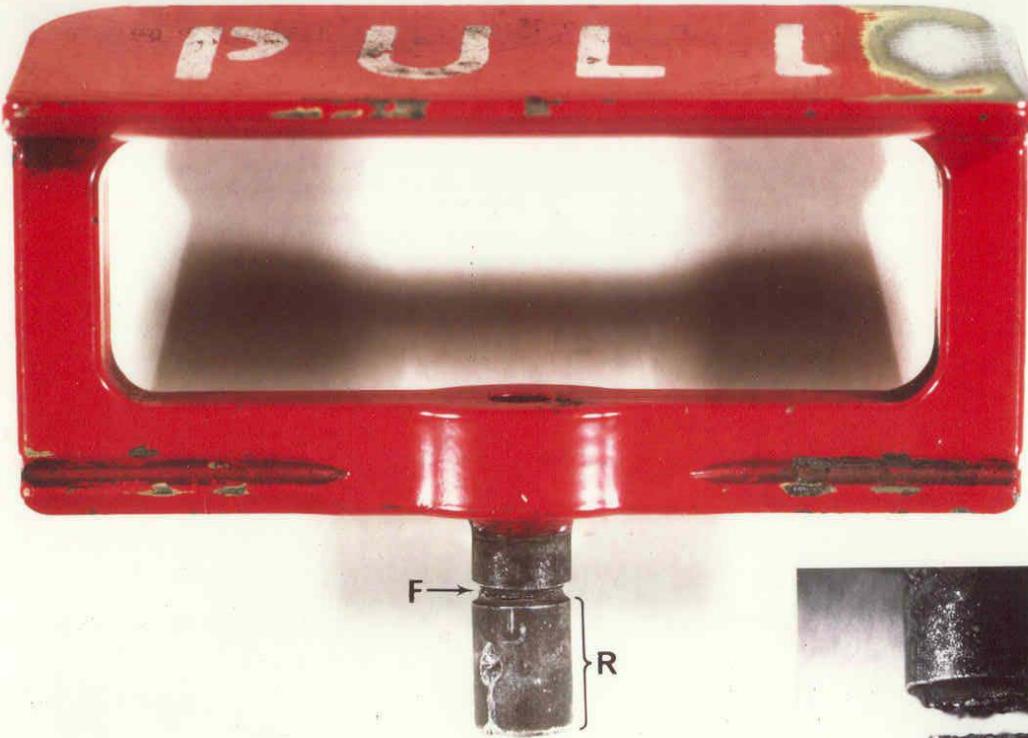


Figure 3: Accident airplane's release handle after removing from the cable and handle support assembly. The mating fracture halves are mated at arrow "F". Bracket "R" locates release handle shaft remnant found in handle support assembly.





San Juan, PR (June 1998)

- American Airlines A300 experienced engine fire shortly after takeoff
- Evacuated passengers on runway
- Four left side exit not usable
- Doors 1R and 3R did not operate as intended
 - Other problems discovered during investigation





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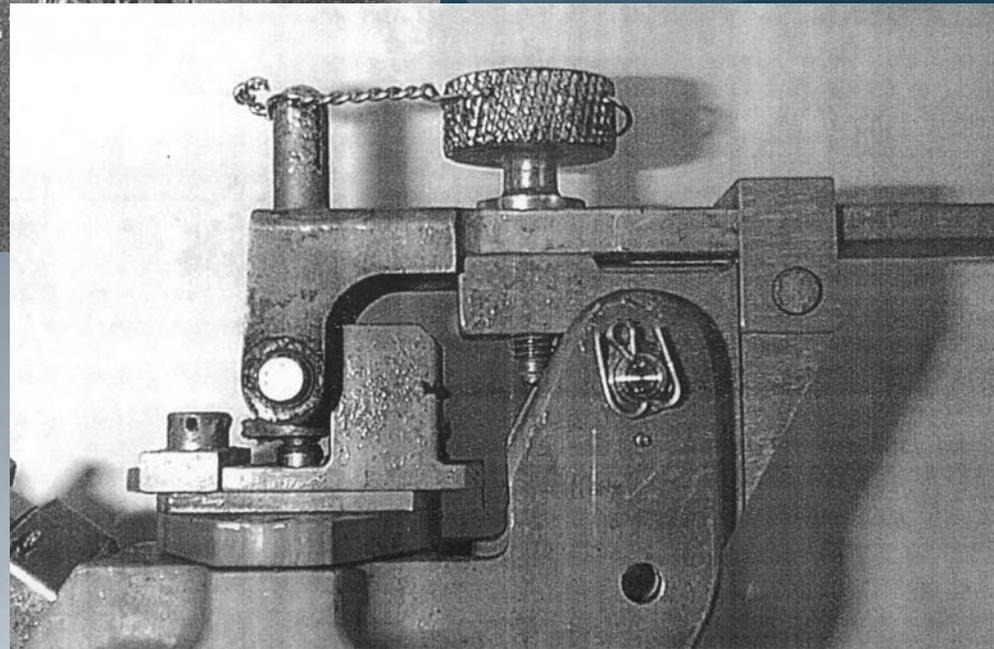
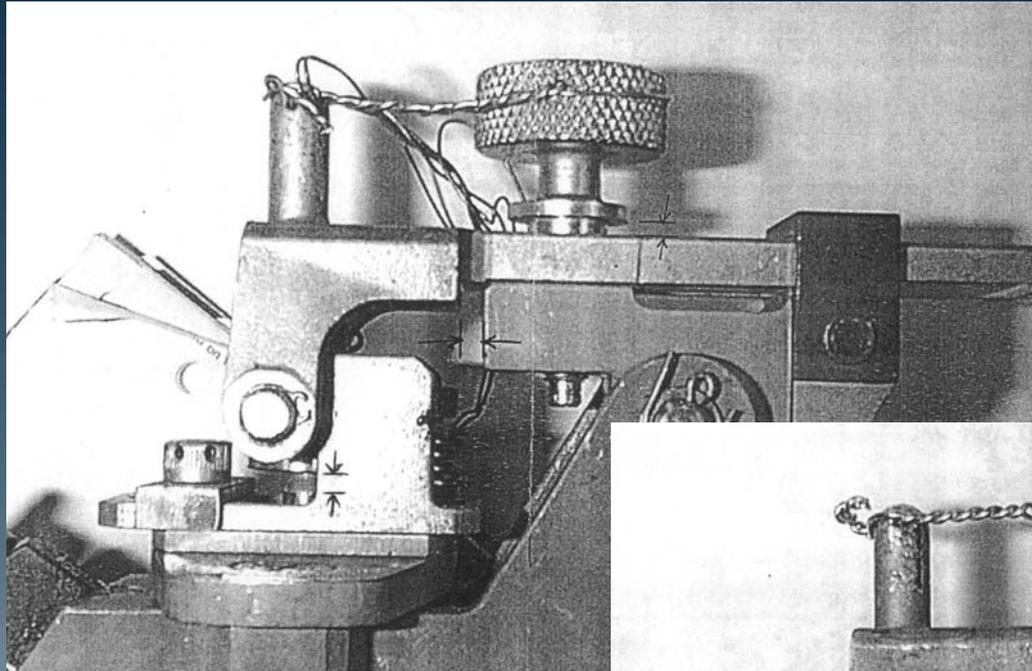
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American Airlines

Airbus A300B4-605R, N80057

San Juan, PR

July 09, 1998

1407 UTC



Honolulu, HI (August 1997)

- Delta Air Lines L-1011 performed rejected takeoff
- Wheel/brake fire ensued in left main gear
- Passengers evacuated through 6 of 8 exits
- Two doors experienced failure of evacuation systems

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Detroit, Michigan (March 2001)

- Northwest Airlines A320 performed rejected takeoff and ran off runway
- All exits opened for evacuation
- Evacuation slide/raft at door 2L separated from airplane when door was opened
 - Pack fell to ground with girt bar and did not inflate





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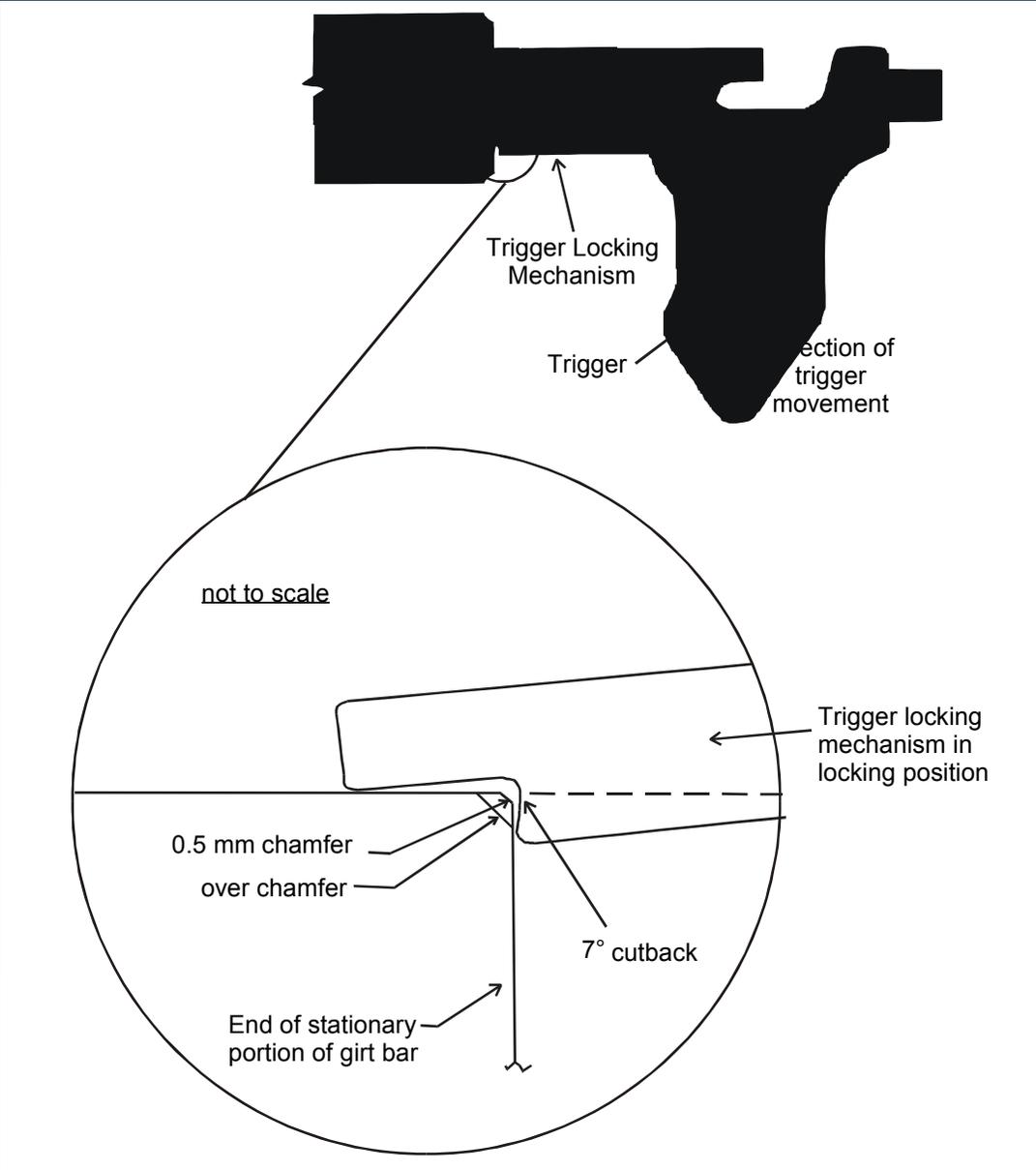
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Adequacy Of Existing Emergency Evacuation System Maintenance Programs



- All U.S. carriers have FAA-approved maintenance programs for each type of plane they operate
- PMIs receive guidance from Inspector Handbook 8300.10 and MRB report
- Maintenance programs may differ between airlines at discretion of each PMI

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Adequacy Of Existing Emergency Evacuation System Maintenance Programs



- Required on-airplane deployments is generally very small
- Usually not more than one shipset per year
- At least one carrier has been permitted to perform no on-airplane deployments
- Inadvertent deployments are allowed to count towards maintenance deployment requirement



Adequacy Of Existing Emergency Evacuation System Maintenance Programs



- Safety Board recommendation A-99-99 asked FAA to discontinue practice of allowing inadvertent deployments to count towards maintenance requirement
- Reasons
 - Conditions not controlled
 - Important information not collected

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Adequacy Of Existing Emergency Evacuation System Maintenance Programs



- FAA agreed with the intent of the recommendation
- But also responded that inadvertent deployments are “not used as maintenance program compliance demonstrations”
- Safety Board disagreed with that statement

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**ENGINEERING SPECIFICATION
MAINTENANCE**

ESM	A300
PAGE 25 - 9	REV BF
DATE	12/17/1998

System - 25 - Equipment/Furnishings

ITEM NUMBER (EngSec)	ITEM	SPEC. REQ.	TASK DESCRIPTION	ZONE	MSG MTC PRCS	INTERVAL (THRESHOLD)	CONTROL DOCUMENT
16.00 (36)	ESCAPE SLIDES / RAFTS	@	OPERATIONAL CHECK - ESCAPE SLIDES / RAFTS SYSTEM - BY SAMPLING) @TEST OF ONE SLIDE OR SLIDE RAFT PER DOOR POSITION PER YEAR 1) -SYMMETRICAL DOORS ARE CONSIDERED AS ONE DOOR POSITION. 2) -SWAPPING SIDES YEARLY IS RECOMMENDED 3) -RECORDED INADVERTENT OR CREW TRAINING DEPLOYMENTS MAY BE USED IN SATISFYING THIS REQUIREMENT	200		1 Years	2904 2905
17.00 (36)	INDIVIDUAL LIFE VESTS	@	CHECK - OVERHAUL DUE DATE @REPLACEMENT REQUIRED 6 YRS AFTER MANUFACTURE DATE OR 3 YRS AFTER DATE OF RESTORATION.	200	8	2B	0913 2431 2437 2438 2439 ERO 11390



Adequacy Of Existing Emergency Evacuation System Maintenance Programs



- NTSB recommendation A-99-100 asked the FAA to require operators to perform a one-time sampling of evacuation system deployments
- In response, the FAA formed a joint FAA/industry response team to examine 10 years of SDR data on evacuation systems

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Adequacy Of Existing Emergency Evacuation System Maintenance Programs



- NTSB disagreed with using SDRs for this purpose
 - Concerned that reporting requirements may not be adequate to identify recurring failure modes
- Safety Board staff reviewed SDR system as part of its investigation of A300 incident
 - Found missing, misleading, and inaccurate entries



Example Of Inaccurate SDR Report



740DA LKHEED			SLIDE	MALFUNCTIONED
TAKEOFF	0	OTHER	ABORTED TAKEOFF	R4 DOOR
DALA 1011385115				
08/07/1997	0			
2565 193C1244			SO	DLL14971585
199708210037				

A FOUR RIGHT DOOR DID NOT OPEN AND THE SLIDE DID NOT DEPLOY DURING EVACUATION.
FOUND 'T' HANDLE NOT FULLY DEPLOYED, OPS
CHECK NORMAL.

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Conclusion

- Current maintenance practices and operational checks do not adequately ensure that emergency evacuation systems will operate as intended in the event of an actual emergency evacuation
- More aggressive measures are needed to identify and correct potential malfunctions *before* they occur in an actual evacuation

